

Applying an Economic Framework in the Reclaimed Water Feasibility Study

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Overview

- ▶ Overview for the Feasibility Study (FS) as a whole
- ▶ Brief Refresher on the Economic Framework
- ▶ Applying the Economic Framework within the Context of the FS
- ▶ Reviewing the “Illustrations”
 - A preview of what will be detailed in the FS

Intent of the Feasibility Study

- ▶ Feasibility Study (FS) as first step in longer process
 - Addresses points raised by Regional Water Quality Committee
 - Review technologies, financing sources, and update regional market
 - Review possible enviro and regional benefits
 - Does NOT green light any specific RW *projects*
- ▶ To be followed by a recommendation to develop a Comprehensive Plan

Refresher/Overview of Economic Framework

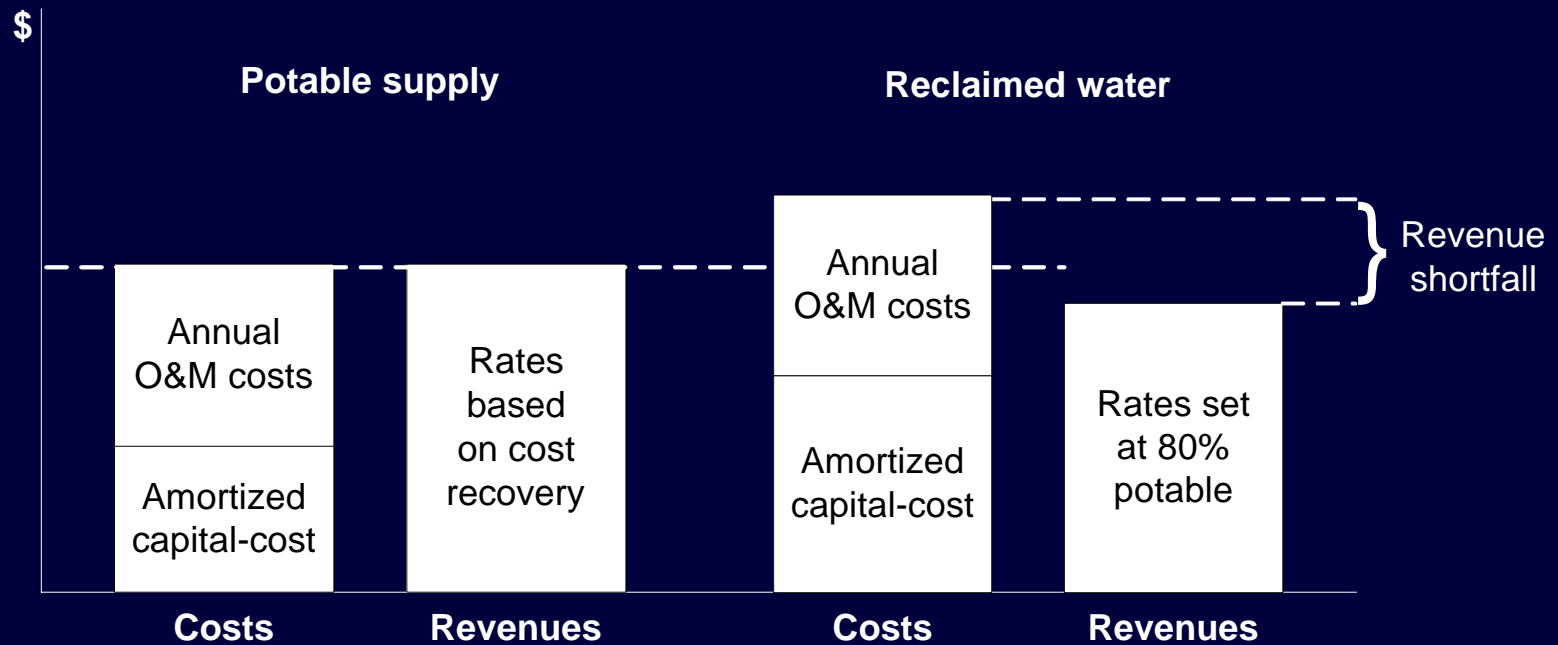
- ▶ Financial versus Economic perspectives
 - Financial: revenues and costs (cash flows)
 - Economics: benefits (social value) v. costs
 - Cash flow versus net social benefits
- ▶ Cost-effectiveness (C-E) v. Benefit-Cost Analysis (BCA)
 - Link to Triple Bottom Line (TBL)
 - Key types of benefits (values) to consider

Why the **Financials** May Look Unfavorable

Revenues from reuse projects often limited

- ▶ Pricing strategies and other constraints
 - Reuse often priced to sell water at below cost of potable supplies
 - Nationwide, potable supplies often under-priced (e.g., average v. marginal costs, infrastructure)
- ▶ Volume of sales may be limited to targeted uses and by proximity to delivery infrastructure

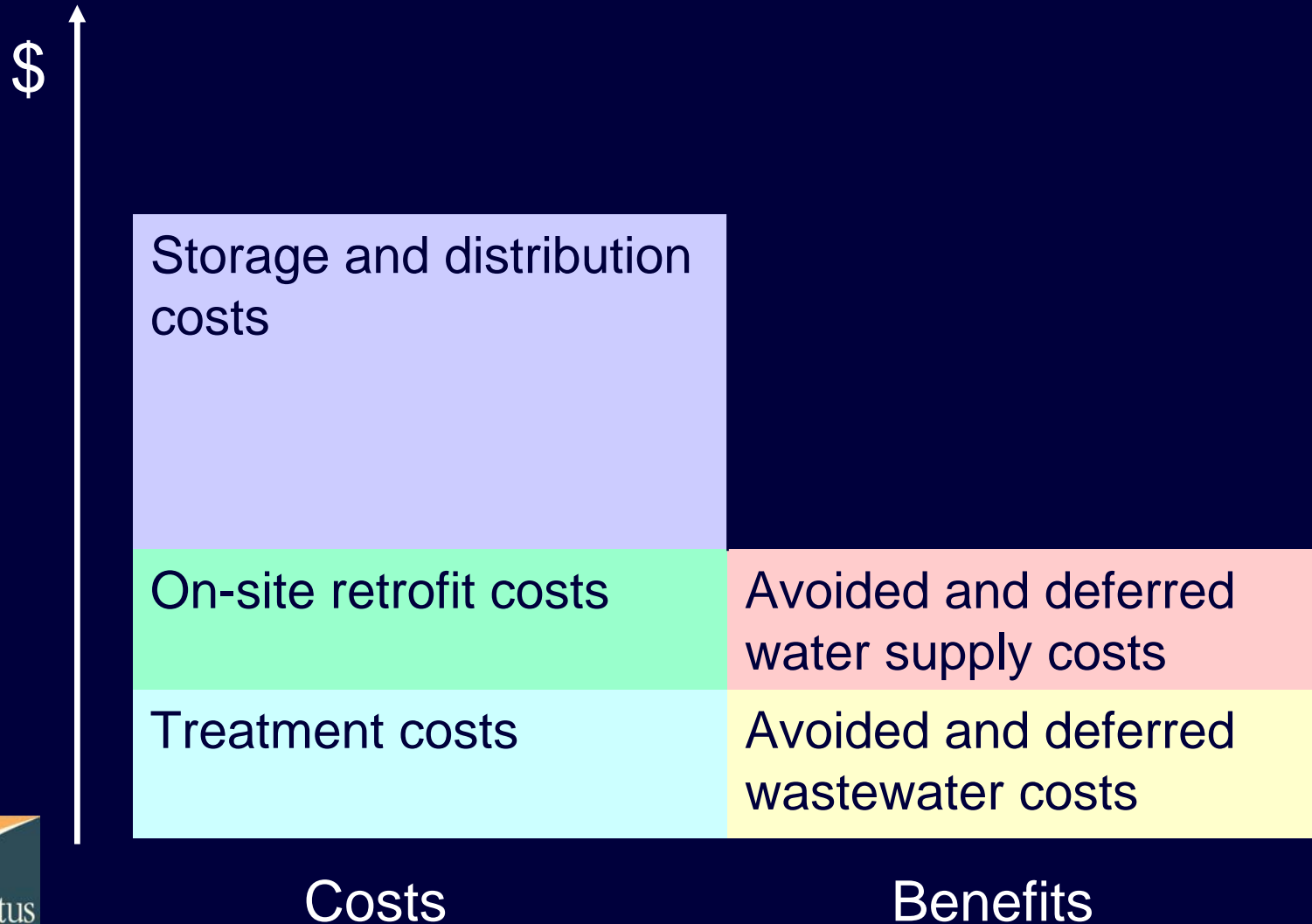
Revenues versus Costs for Typical Potable and RW Approaches



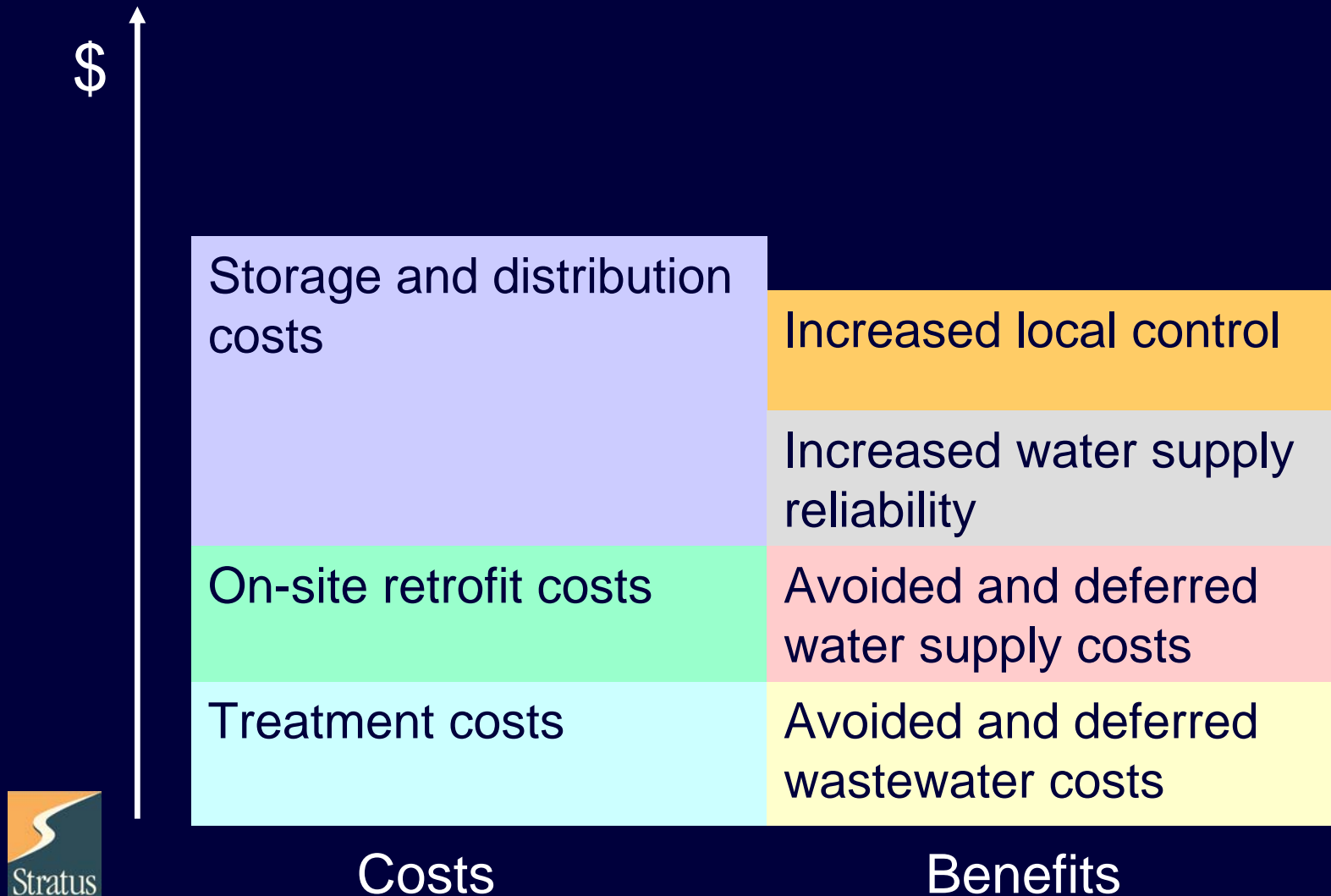
Why Look at the **Economic** Perspective?

- ▶ For many reuse projects, the benefits (i.e., value) to society may outweigh the costs
 - Broad range of benefits (some obscure)
 - Large and diverse set of beneficiaries
- ▶ Where benefits shown to outweigh costs:
 - Identify benefits and beneficiaries who might not be ratepayers (outside of service area)
 - Positive externalities become a valid basis for seeking cost sharing and subsidies

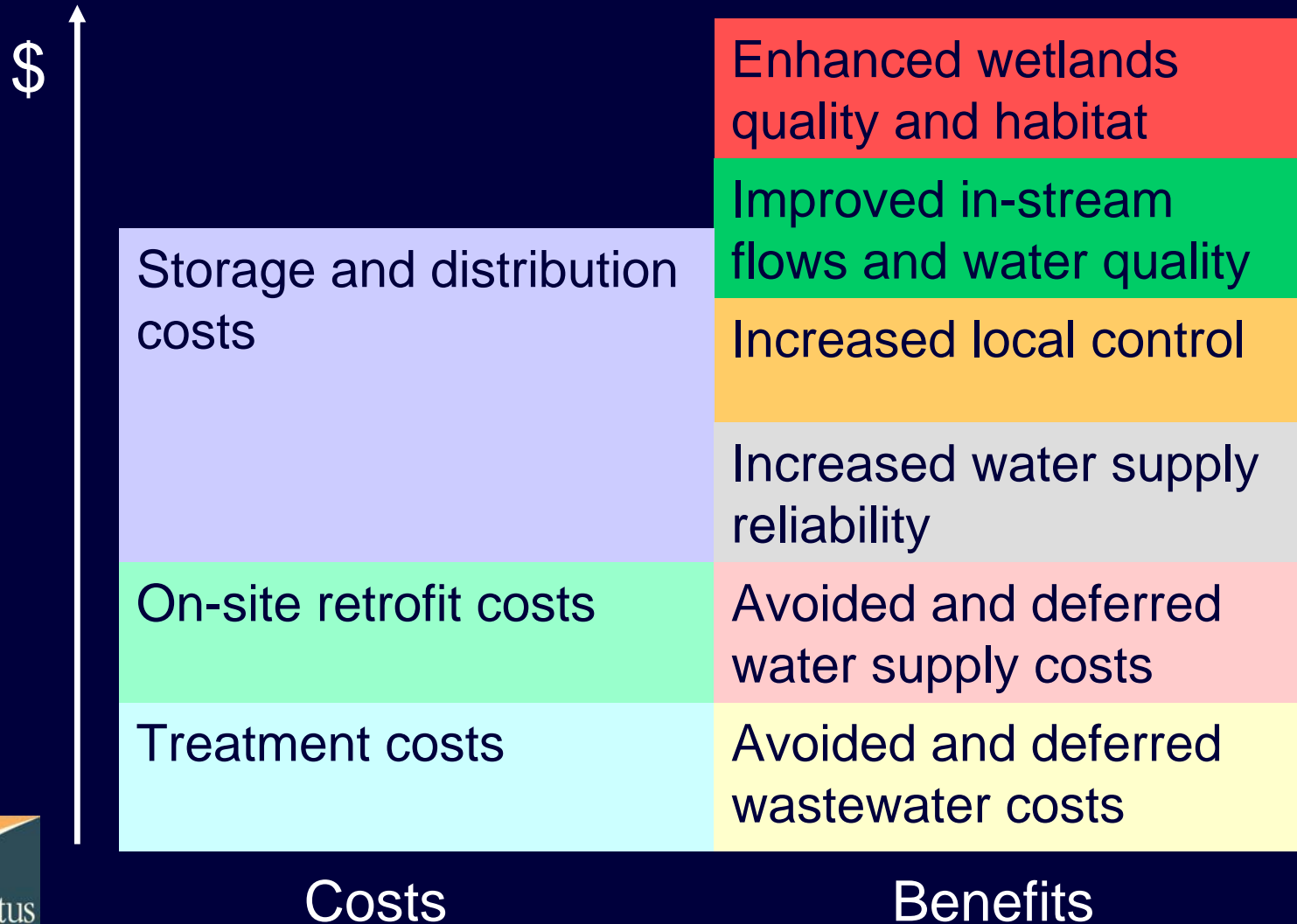
Counting All the Benefits



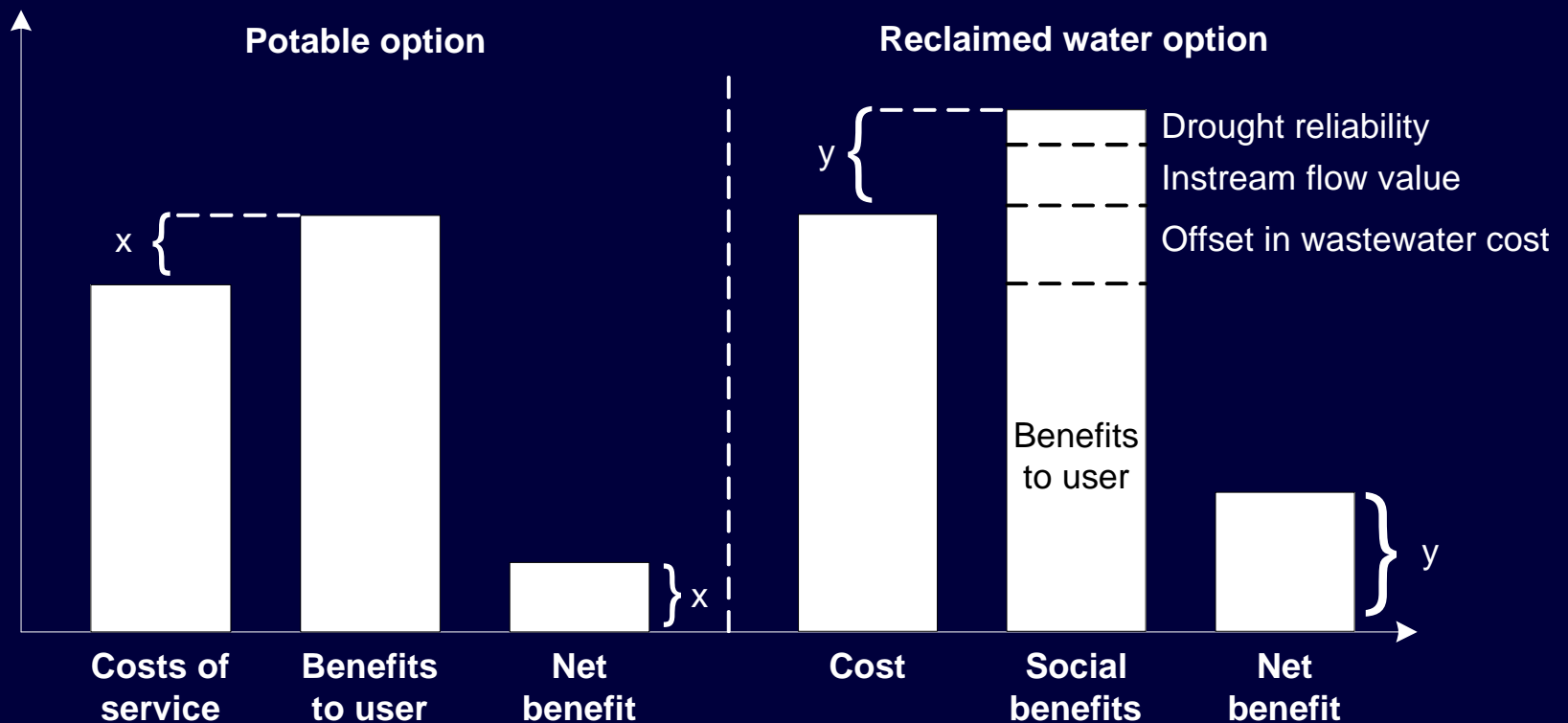
Counting All the Benefits



Counting All the Benefits



Some RW Uses May Offer Higher Net Benefits than Alternatives



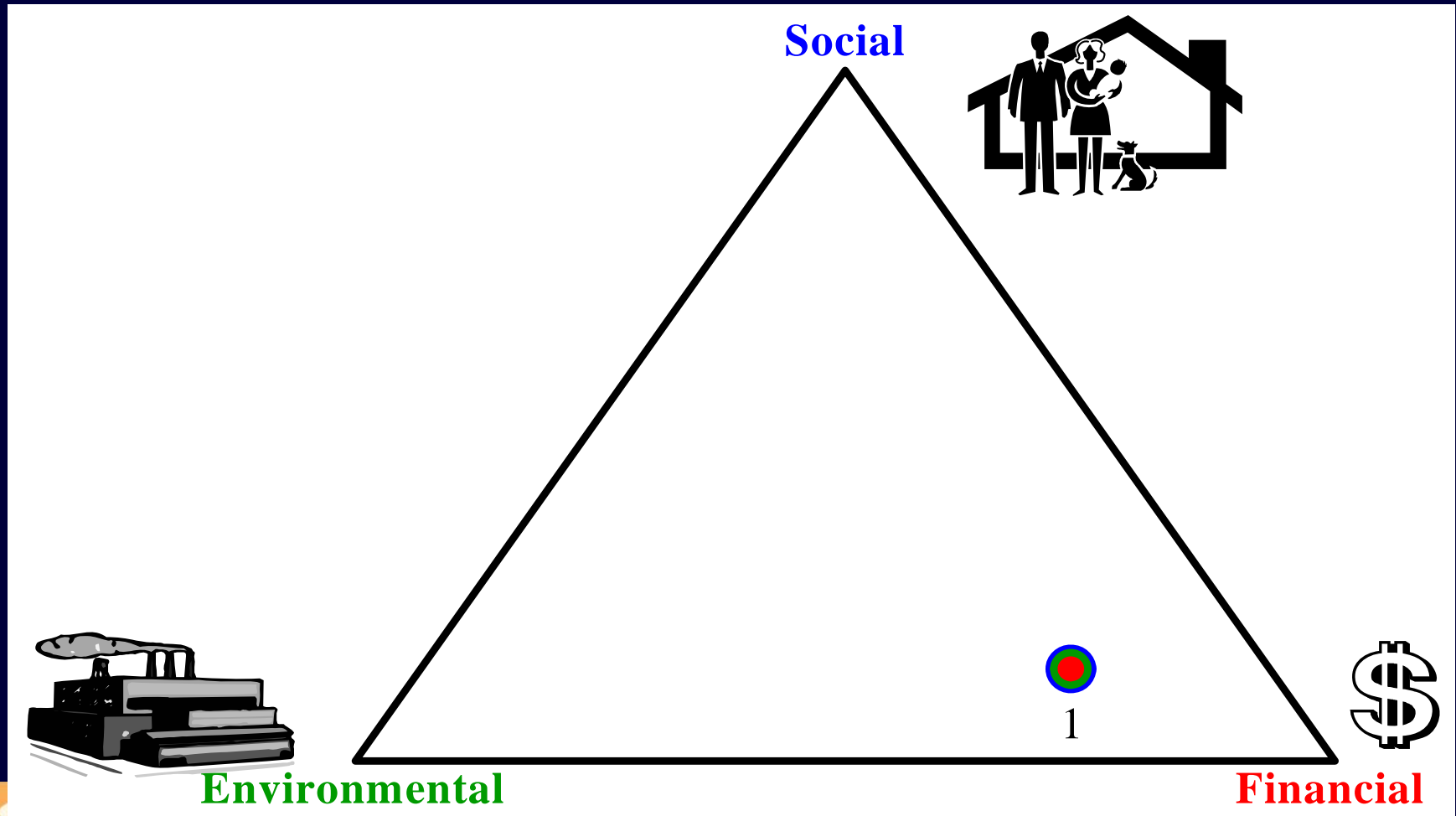
Link to Triple Bottom Line

- ▶ TBL can be a useful approach for trying to reflect broad array of all benefits (and costs)
- ▶ Three bottom lines, to reflect:
 - Financial results (cash flow, revenues & costs)
 - Social outcomes (e.g., employment, equity)
 - Environmental (e.g., instream flows, fisheries)
- ▶ In essence, TBL = an initial step of a social benefit-cost analysis
 - Identifying all benefits & costs; both internal and external

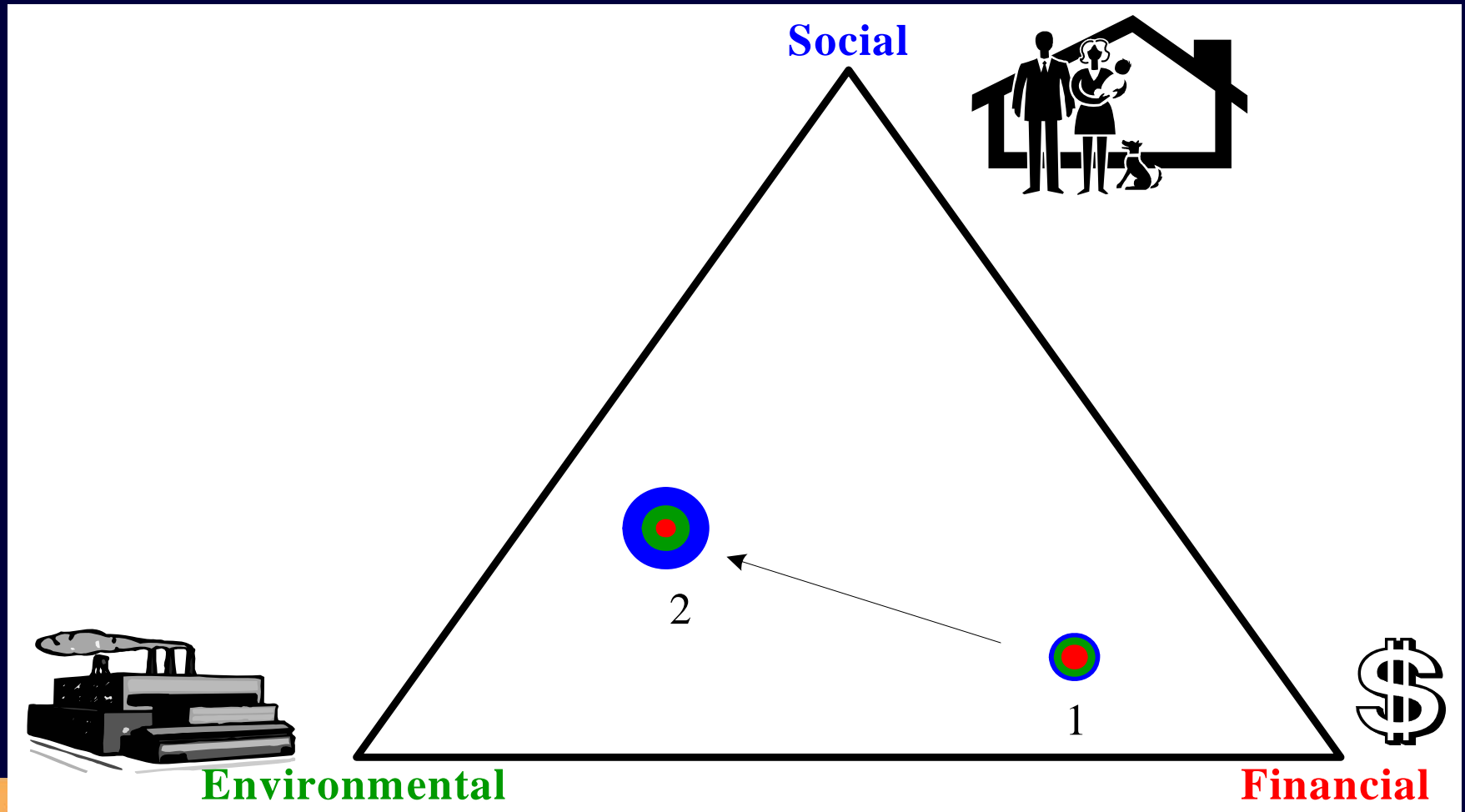
Types of Benefits

- ▶ Financial Benefits
 - Avoided costs in water supply development or wastewater management
- ▶ Social Benefits
 - Increased water supply reliability
 - Promoting community values (e.g., green ethic, enviro justice, ag. land preservation)
 - Potentially increased aesthetics
 - Flexibility / hedge against uncertain future
- ▶ Environmental Benefits
 - Instream flow and temperature; ESA aspects
 - Improved quality in effluent receiving waters

Choosing the Least Cost Option May Not Deliver Social and Environmental Values to the Community



Options that Meet Broader Goals May Increase Financial Costs to a Utility, but Yield Larger Net Benefits to the Community



Intent of the Economic Framework

- ▶ Typically, intent is to apply systematically to specific projects
 - To determine if project benefits justify costs
 - To compare option to its viable alternatives
- ▶ In context of King County RW Feasibility Study
 - RW program in early development
 - Hence framework applied at preliminary level
- ▶ Useful for identifying issues and approaches
 - Intent is to use full framework in future, on more fully defined projects

Overview of the Framework

1. Define the baseline (work w/ stakeholders)
2. Define relevant options
3. Identify full range of benefits and costs
4. Screen benefits and costs
5. Quantify benefits and costs (to extent feasible)
6. Value benefits and costs (to extent feasible)
7. Qualitatively describe nonquantifiable Bs & Cs
8. Summarize and compare benefits and costs

Overview of Framework (cont.)

9. List and assess all omissions, biases, and uncertainties (OBUs)
10. Conduct sensitivity analyses
11. Compare results to stakeholder perceptions
12. Use as communication tool throughout
 - Document key inputs and assumptions
 - Promote transparency
 - Embrace stakeholder input

Defining the Baseline

- ▶ A critical key to a good economic analysis is to ensure proper definition of the baseline
 - Intent is “*without* project” v. “*with* project”
 - For RW, a key is to look broadly at all the water resource challenges facing the region in the future
- ▶ Defining the baseline can be real challenge
 - “The future ain’t what it used to be.” (Yogi Berra)
 - Given climate change, ESA issues, & other factors, we need to consider alternative futures

Baseline: Regional Water Resource Challenges

- ▶ Protect and enhance surface water quality
 - Limit effluent discharge to Puget Sound
- ▶ Protect and restore threatened/endangered populations
 - Improve instream flows and temperatures
- ▶ Assure reliability of regional water supply
 - Avoid stress on regional supplies
- ▶ Adhere to and reflect community environmental values
- ▶ Provide flexibility for changing circumstances

Alternative Baselines

- ▶ Status quo
 - Future closely resembles today
 - Basis for FS Illustrations
- ▶ Climate change impacts
 - e.g., hotter, longer, drier summers?
- ▶ Increased pressure on threatened/endangered species
 - e.g., heightened need to preserve, augment, restore
- ▶ Puget Sound Initiative
 - e.g., cost of WW discharge elevated

Equity Perspectives (who pays, who benefits?)

- ▶ Beneficiaries are case-specific:
 - ▣ On-site: e.g., RW users who enjoy lower cost of RW relative to potable supply cost
 - ▣ Off-site: e.g., salmon habitat supporters region-wide and beyond
- ▶ Cost bearers also depend on specifics, e.g.:
 - ▣ How any net revenue shortfall is covered
 - ▣ Whether RW creates cost offsets
 - ▣ Presence of external or partner funding (e.g., cost sharing, grants)

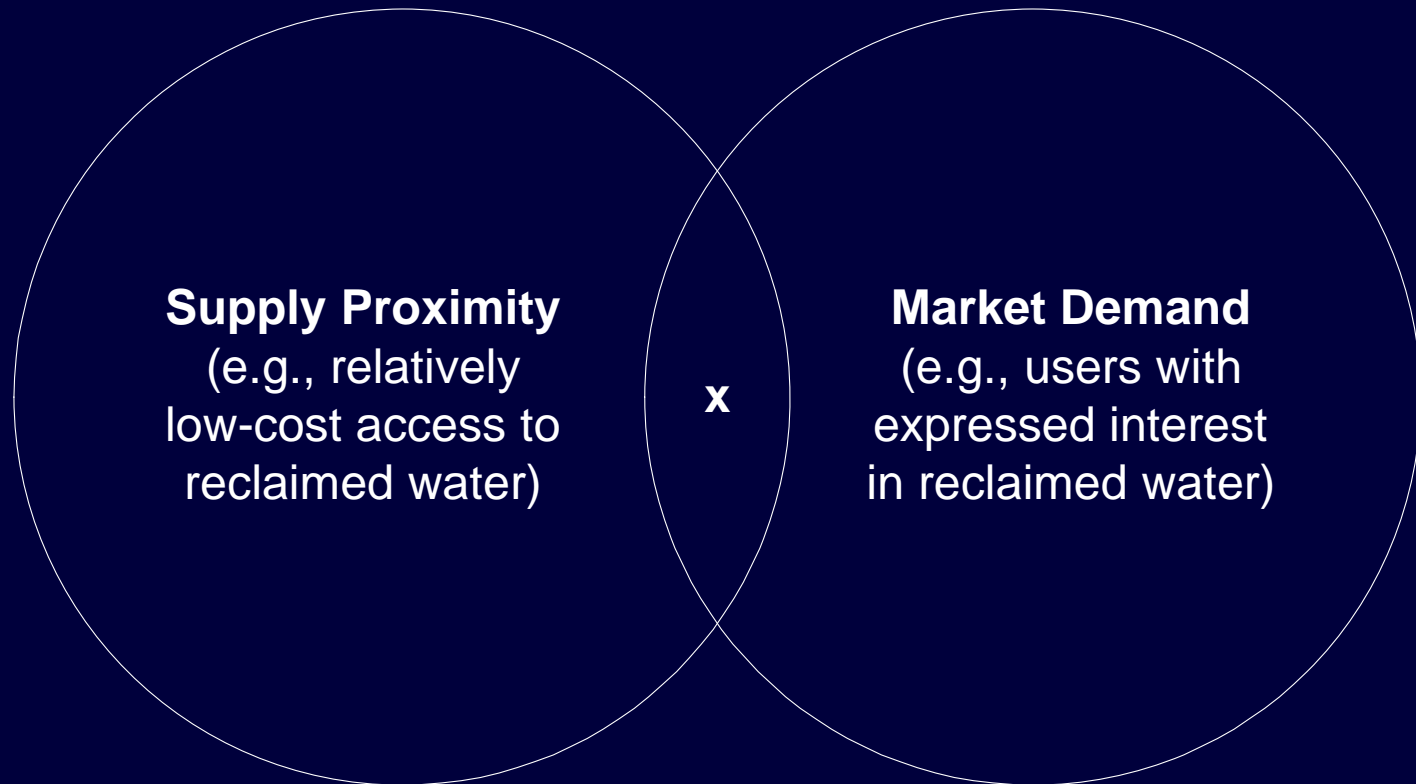
Economic Framework in FS Context

- ▶ Economic Framework within the context of the Feasibility Study: What it is NOT
 - RW program in early stages of consideration
 - Most key “policy” issues still open to discussion
 - Pricing and cost recovery
 - Wholesale/retail arrangements

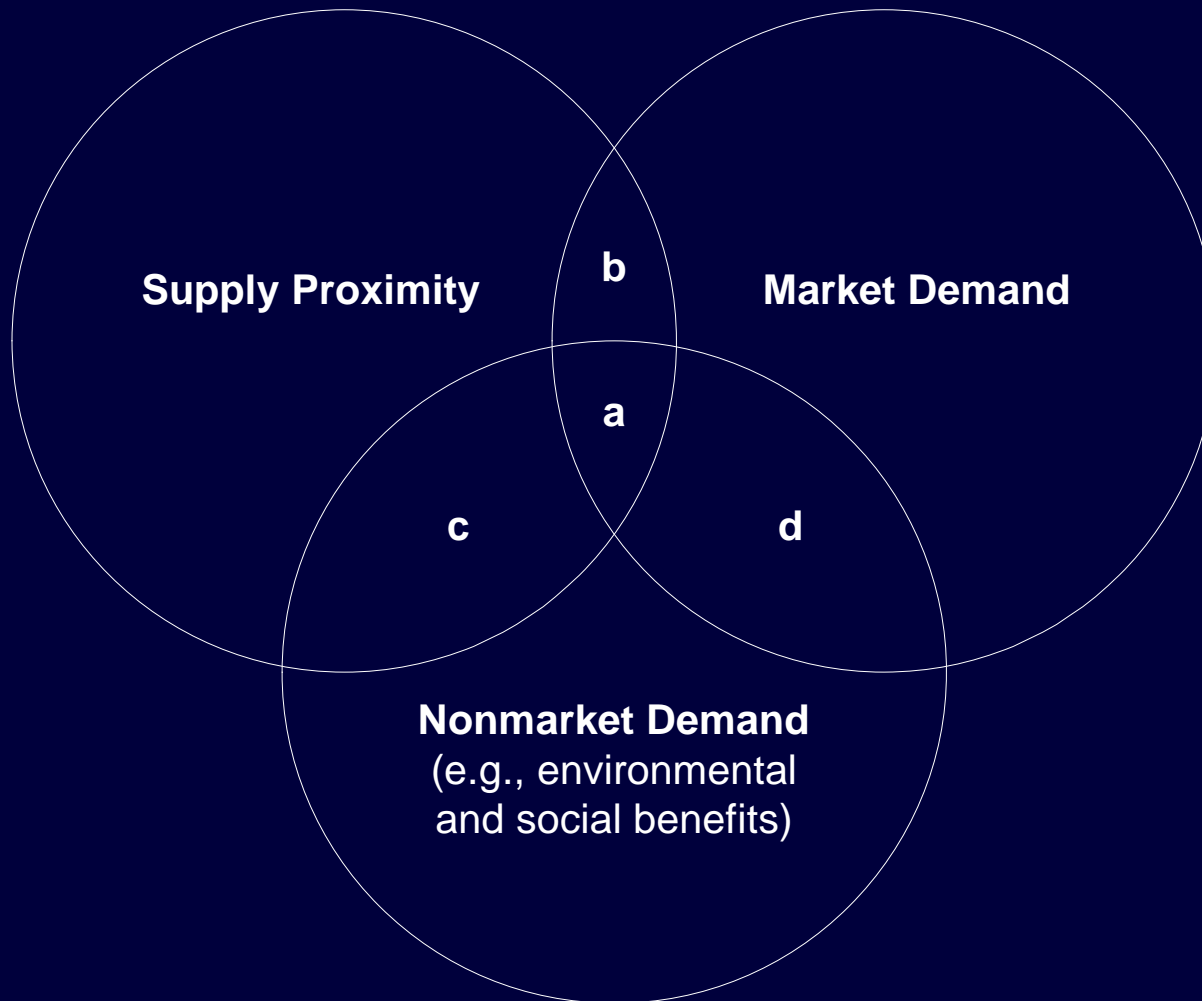
Framework in FS Context (cont)

- ▶ Economic Framework within the context of the Feasibility Study -- What it IS:
 - Useful to guide program development
 - Basis for more formal assessments if/as program takes shape in future
 - When specific projects emerge for consideration
 - Including relevant comparisons to water supply alternatives

Typical “Market-Based” Approach to RW Program Development



Adding Nonmarket Values to Help Guide a RW Program



The Illustrations

- ▶ Seven possible future RW applications assessed
 - Projects are simply illustrations
 - As described in last meeting
 - 30,000 foot overview (not full framework)
 - Not selected as the “best” cases
 - Some look better than others
 - Simply a range of possible RW uses, from north to south

Key Assumptions in Illustrations

- ▶ Financial assumptions for these analyses
 - Backbone and other existing facilities are sunk cost
 - Local distribution costs to the user's property line are generally included in project costs
 - We apply a price for RW at 80% of the applicable potable rate
- ▶ These are plausible assumptions, placeholders
 - Do not necessarily imply County policies

Overview of Illustrations

- ▶ A brief overview and summary provided for each of the seven illustrations
 - Uses the Venn diagram and TBL triangle to help summarize
 - Additional detail provided on some of the illustrations (and even more in FS)
- ▶ Illustrations serve as a starting point
 - Reveal range of possible outcomes
 - Help guide future program and discussions

Bothell Business Park

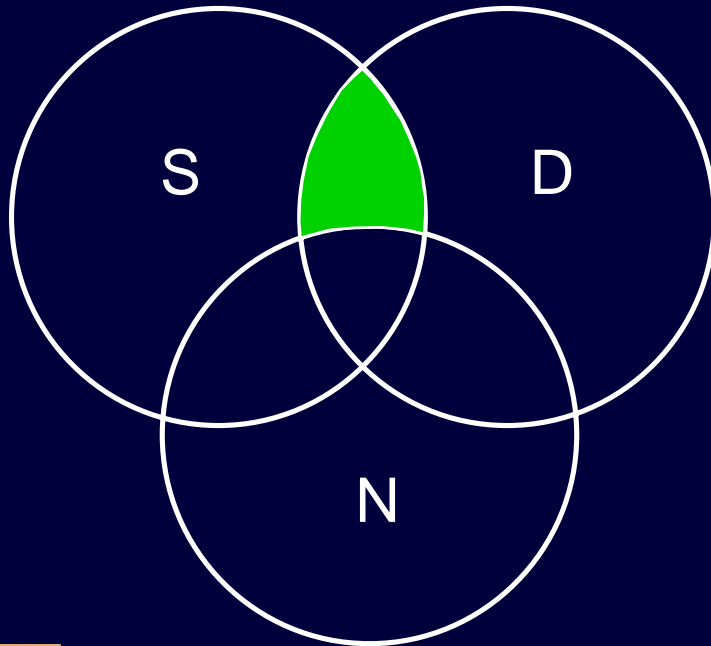
- ▶ RW replaces potable for commercial landscape irrigation (and some potential other uses)
- ▶ Proximity to Brightwater makes this a relatively low cost exercise
- ▶ Revenues (based on 80% of applicable potable rate) outweigh annualized costs

Bothell Business Park Illustration in Greater Depth

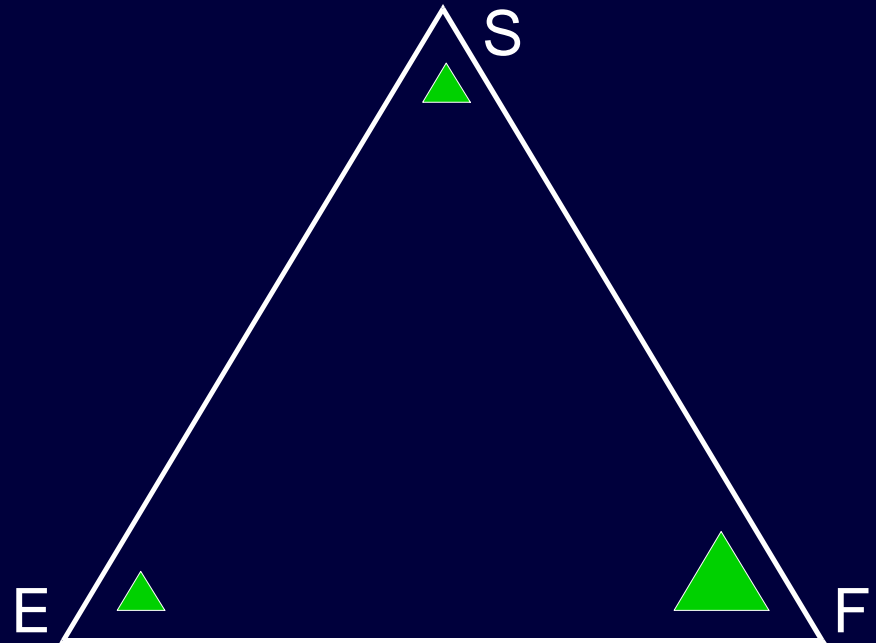
- ▶ Insights on optimizing within project design
 - Cost savings due to delaying delivery
 - Large impact on net revenues
- ▶ Possible cost-sharing improves net revenues (and alters “perspectives” assessment)
- ▶ Opportunities for other customers to tap into extended distribution lines

Bothell Business Park Illustration

**Value-cost
prospects**



**TBL
prospects**

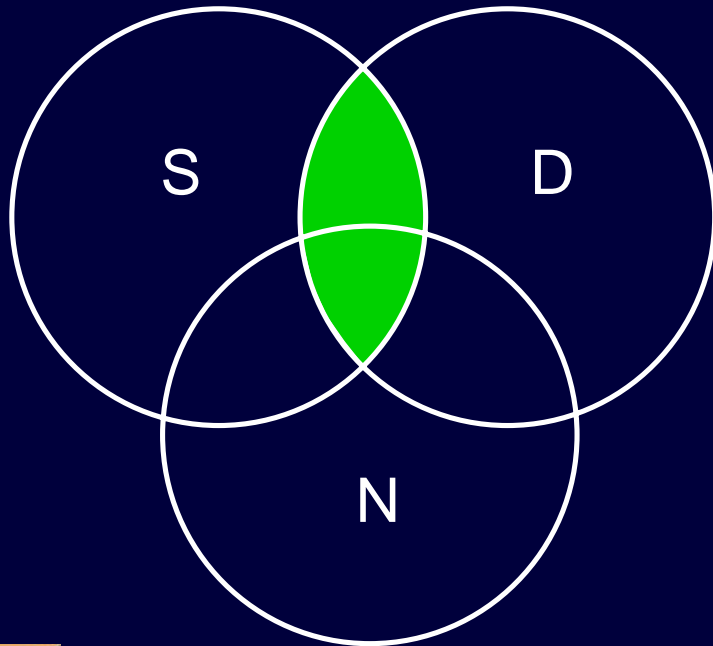


Marymoor Park

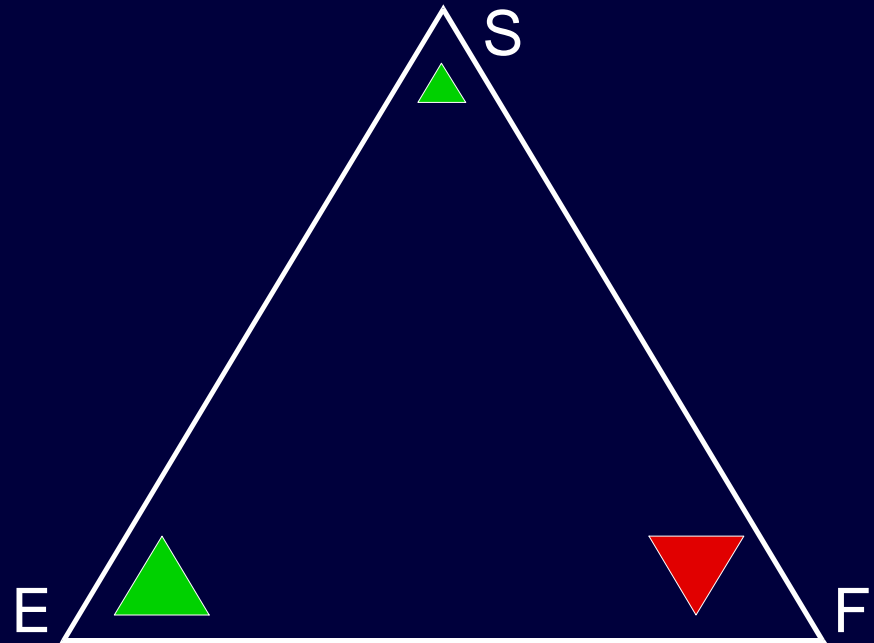
- ▶ RW replaces potable supply for park landscape irrigation
- ▶ Involves extension of RW transmission line from Willows Run
- ▶ Savings in potable water payments offset by cost of delivering RW (net costs > 0)
- ▶ Potential benefits include possible instream flow enhancement and more extensive irrigation of park

Marymoor Park Illustration

**Value-cost
prospects**



**TBL
prospects**

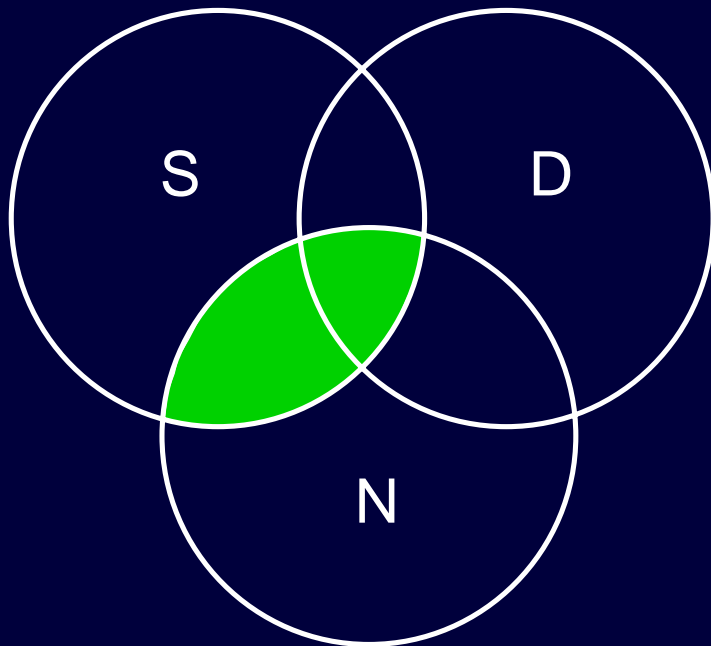


Sammamish Agricultural Irrigation

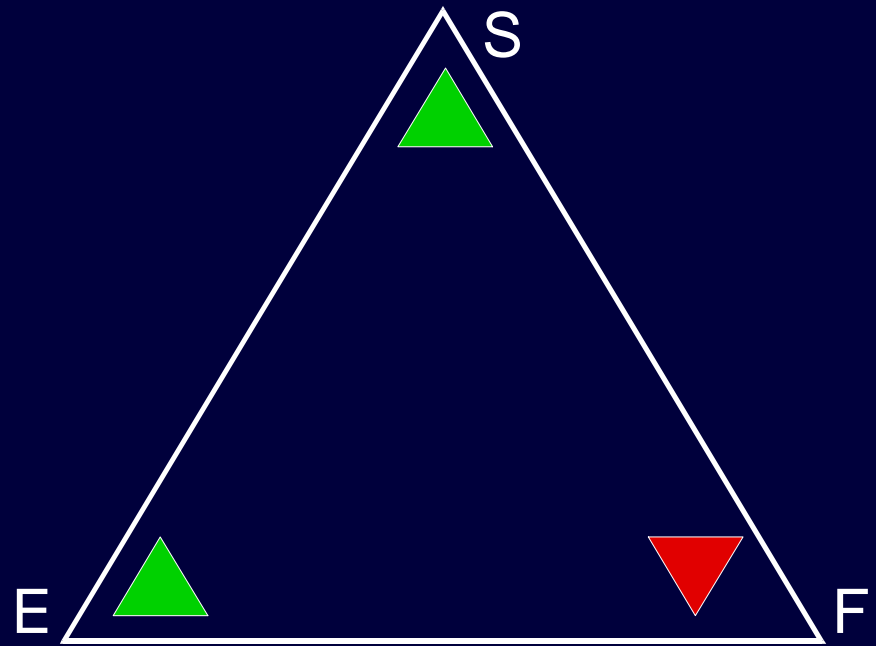
- ▶ RW replaces surface & groundwater extractions by commercial growers
- ▶ Illustration does not include revenue generation
 - Swap RW to obtain & retire water rights
- ▶ Benefits include
 - Enhanced summer flows in Sammamish River
 - Improved agricultural production & agricultural lands preservation
 - Improves prospects for Hmong farmers (environmental justice)

Sammamish River Agriculture Illustration

Value-cost prospects



TBL prospects



Sammamish Agricultural Irrigation illustration in greater depth

- ▶ Assuming no revenue collected (e.g., water rights impacting River are retired in lieu of payment for RW)
 - \$290,000 per year cost to provide RW
 - Simple “Benefits Transfer” can help indicate if cost may be warranted by environmental / salmon value
- ▶ Quantity aspect and assumptions
 - 1300 AF per year current irrigation
 - 50% hydraulic connection to River
 - 650 AF added to stream flow over 150-day season
 - $4.3+ \text{ AF/day} \Rightarrow 2.2 \text{ cfs}$ added daily to stream flow

Sammamish River illustration in greater depth (continued)

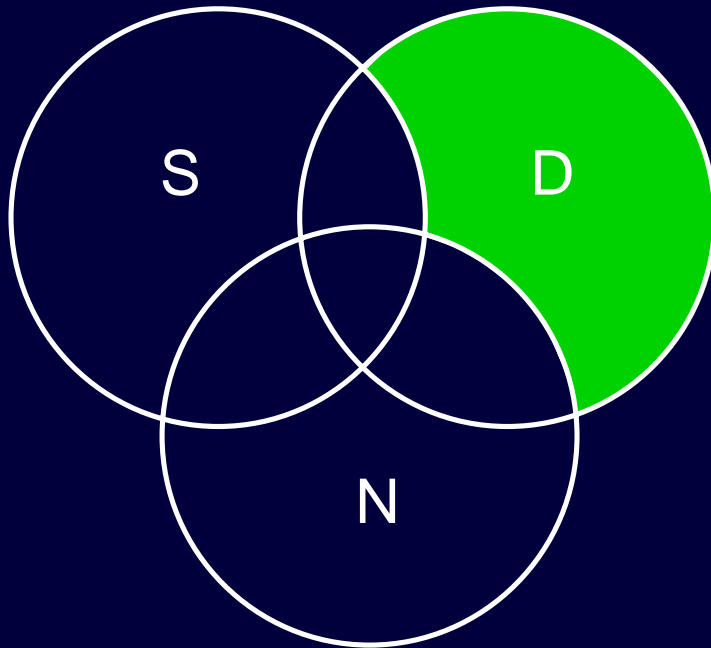
- ▶ Valuation approach and assumptions
 - 2 “willingness to pay” studies show ~\$11 annually per household to preserve instream flows for threatened/endangered species
 - Applied to 750,000 households in King Co => \$8.6 M per year value for region as a whole
 - Sammamish ~ 6% of flow-limited salmon stream miles
 - 6% of \$8.6 M => over \$500,000 per year
- ▶ Alternative study: \$245+/AF for ESA instream flow rights
 - \$160,000 per year (\$245 * 650 AF)
- ▶ On net, project costs of \$290,000 per year may be justified

Nucor Steel

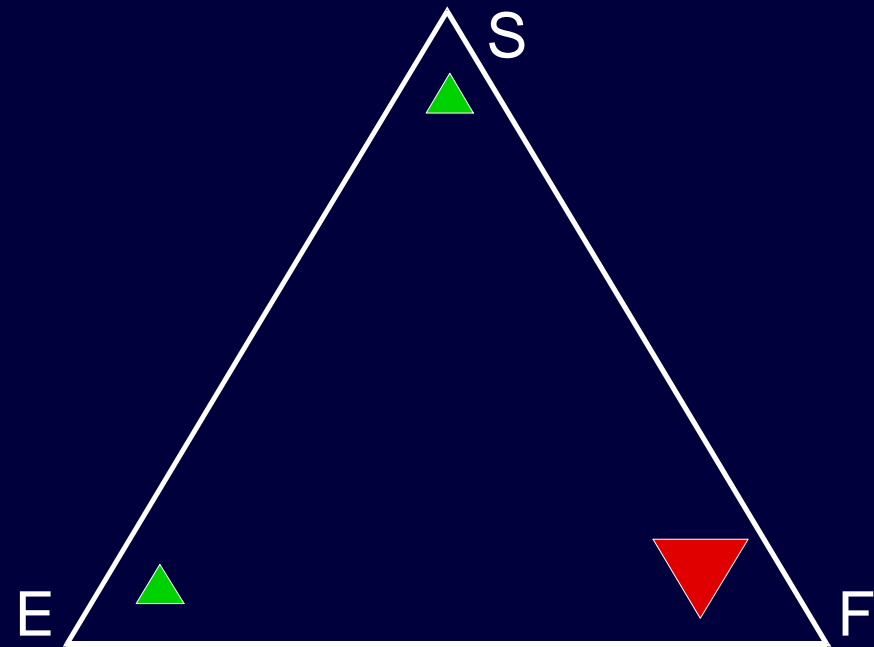
- ▶ RW replaces potable for industrial processes
- ▶ Relatively high cost to provide RW (satellite plant)
 - RW revenues (at 80% potable) are well below costs
- ▶ Benefits include
 - Reduced secondary effluent to Puget Sound
 - Cost-savings to local industry could provide economic boost

Nucor Steel Illustration

**Value-cost
prospects**



**TBL
prospects**



Nucor Steel in greater depth

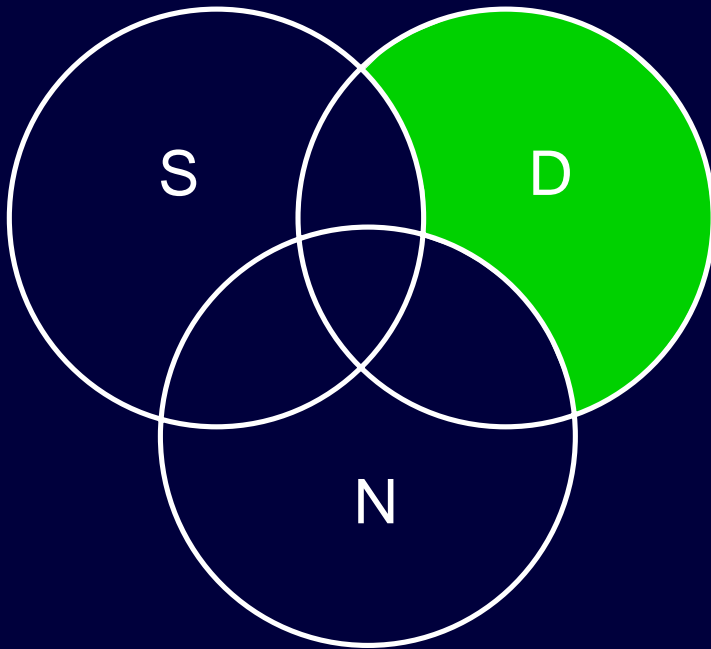
- ▶ All figures are preliminary estimates
- ▶ Costs to provide RW ~ \$ 370,000 per year
- ▶ Revenues, based at retail potable rate:
 - RW at 80% retail rate: ~ \$ 245,000 per year
 - RW at 100% retail rate: ~ \$ 305,000 per year
- ▶ Net revenues: - \$125,000 to - \$65,000 per year
- ▶ Cost savings to Nucor: up to ~ \$60,000 per year

Newcastle Golf Course

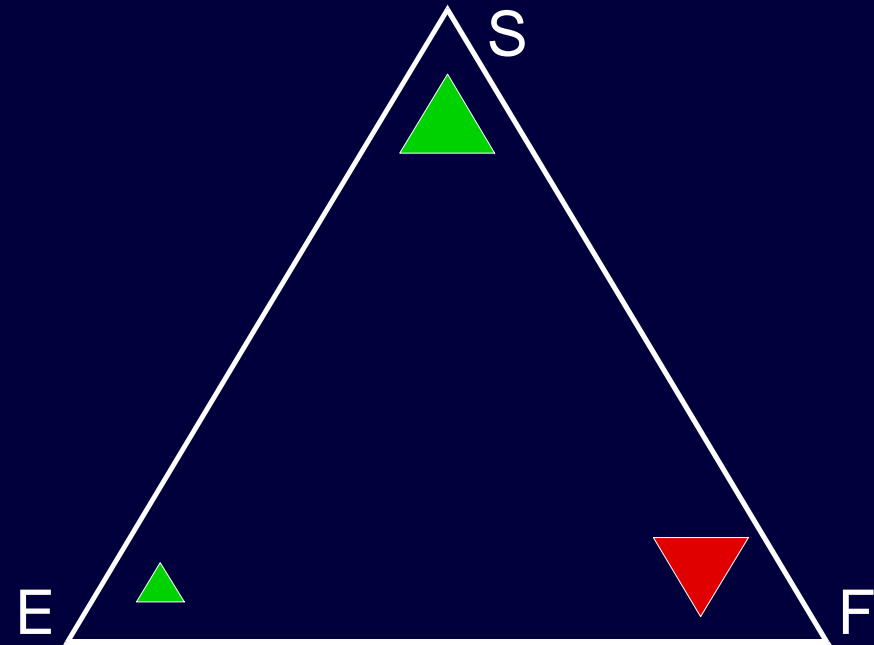
- ▶ RW replaces potable supply for golf course irrigation
- ▶ Satellite plant implies relatively high cost of RW
- ▶ Revenues fall well short of covering costs
- ▶ Benefits include
 - Reduced secondary effluent to Puget Sound
 - Frees potable supply for other needs (offsets or postpones new supply development)

Newcastle Golf Course Illustration

**Value-cost
prospects**



**TBL
prospects**

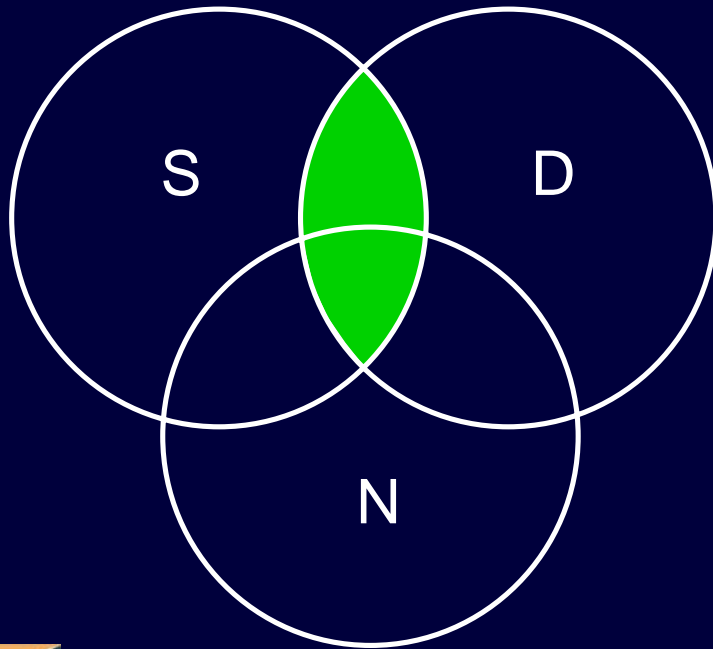


Foster Golf Links

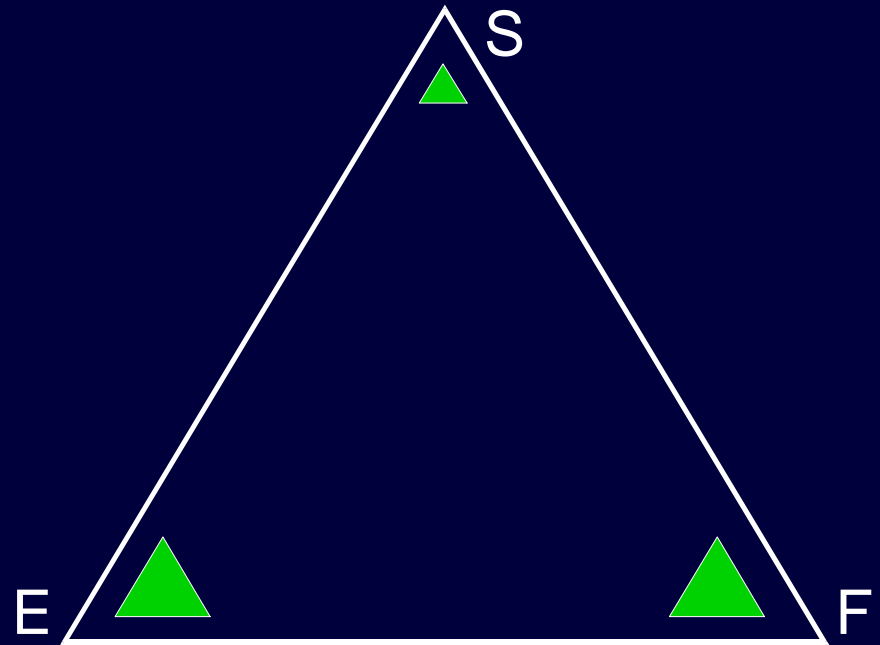
- ▶ Reclaimed water replaces extractions from Lower Green River
- ▶ Revenues exceed costs (helped by proximity to existing South Plant facility and pipeline)
- ▶ Benefits include
 - Improved instream flows for Green River (and hence better conditions for salmon)
 - Higher level of irrigation for Foster Golf Links

Foster Golf Links Illustration

**Value-cost
prospects**



**TBL
prospects**

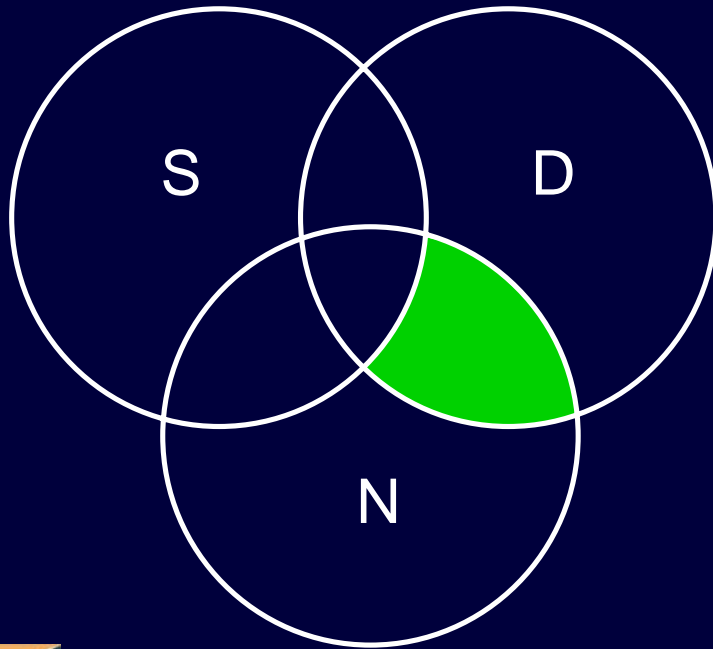


South County/Green River Valley

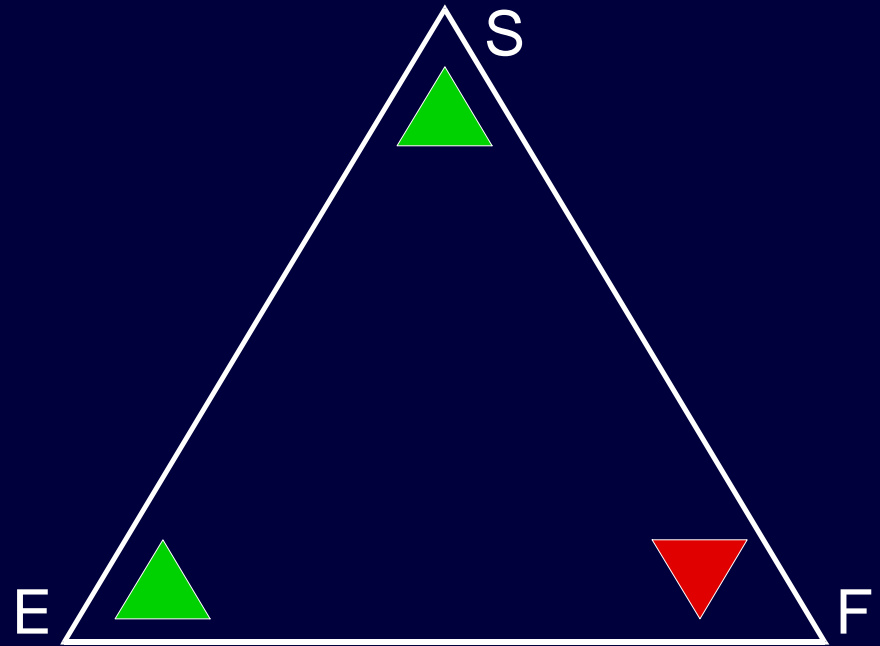
- ▶ Very preliminary exploration of issues
- ▶ Water resource challenges suggest high potential for benefits from RW applications
 - Exchanges to enable further extractions of local groundwater to meet rapid growth need
 - Environmental uses to enhance instream flows and/or wetlands (and aiding salmon)
- ▶ RW may be very costly if applied in traditional purple pipe approach (per Brown and Caldwell study)
- ▶ Challenge: Finding creative, lower cost way to use RW to address the challenges

South County/Green River Valley Illustration

**Value-cost
prospects**



**TBL
prospects**



Findings from FS Illustrations

- ▶ For RW programs nationwide, cost of service typically exceeds anticipated revenues
 - Illustrations show a mix of net revenue outcomes may arise in King County
- ▶ Important to look beyond net revenues to broader net benefit (benefit-cost) perspective
 - RW offers opportunity to address various regional water resource challenges
 - Environmental and social benefits may in some instances be highly valued

Findings from FS Illustrations (2)

- ▶ Perspectives on who ultimately pays and who obtains benefits are case-specific, depending on:
 - Types of benefits generated
 - How any revenue shortfalls are covered
- ▶ Illustrations serve as a starting point
 - Reveal range of possible outcomes
 - Help guide future program and discussions
- ▶ Next steps, beyond the FS, will help address many remaining questions and policy issues

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